

Montana Driver Education and Training



Strategies for Adverse Conditions

Part II



LOW-WATER CROSSINGS

- More than half of all low-water crossing vehicular-related deaths occur at night



Photo courtesy of the AAA Foundation



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Myths and Facts



- **Myth:** The size and weight of my vehicle will keep me from floating away
- **Fact:** People have extreme confidence in the size and weight of their vehicle, and think it can't be washed away—but it can happen very easily
- A 46,000-pound, fully-loaded cement truck was swept down the Los Angeles River in less than two feet of swift water
- Eight percent of ALL FATALITIES in flash floods are the result of drivers ignoring obvious warning signs on open roads, including a washed out road ahead, or driving around marked flood barricades placed by public safety personnel

Fact: All vehicles can float



Myths and Facts



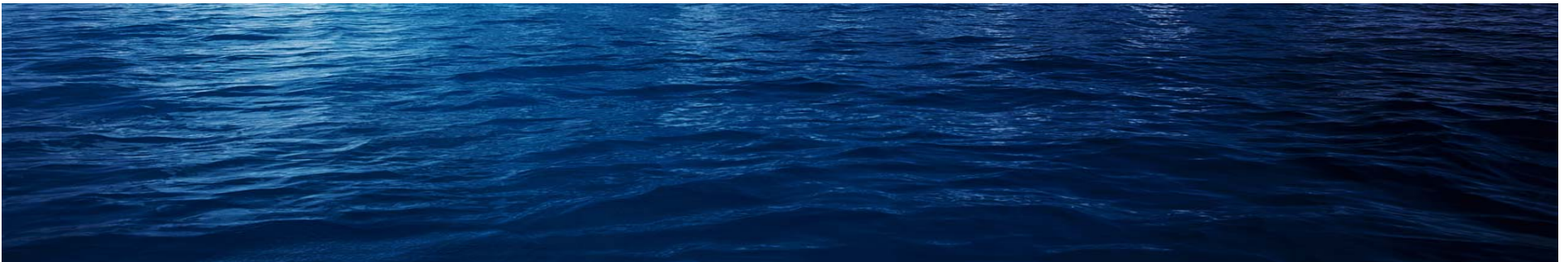
- **Myth:** Driving fast through a flooded roadway will help me cross safely
- **Fact:** Driving fast through water will cause a vehicle to hydroplane—once this begins, all control is lost



Myths and Facts



- **Myth:** If many people have already been able to drive through flooded areas and didn't have any problems, it's probably ok for me to drive through, too
- **Fact:** This is probably the most life-taking misconception
What people do not realize is that only a very small increase in water level will make a big difference



Myths and Facts



- **Fact:** Just six inches of fast-moving flood water can knock a pedestrian off their feet and cause a driver to lose control
- **Fact:** A depth of two feet will float a car
- **Fact:** Water weighs 62.4 lbs. per cubic foot and typically flows downstream at six to 12 miles an hour



Myths and Facts



- **Fact:** When a vehicle stalls in the water, the water's momentum is transferred to the car
- For each foot the water rises, 500 lbs. of lateral force are applied to the car
- **Fact:** For each foot the water rises up the side of the car, the car displaces 1,500 lbs of water
- In effect, the car weighs 1,500 lbs. less for each foot the water rises



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- When rain is channeled quickly to an outflow area, a sudden increase in water occurs, sometimes miles downstream from the storm
- Flash flooding is not specific to any particular time of year
- Flash floods usually occur within a few minutes or hours of excessive rainfall
- Rapidly rising water can reach heights of 30 feet or more
- Flash flooding rains can trigger catastrophic mud slides without warning
- Nearly one-third of flooded roads and bridges are structurally unsound





- If it is safe to jump to dry ground, do so immediately
- Do NOT stay with the car, abandon it immediately for higher ground
- If the water is coming up too fast, or the vehicle has been driven too far out, DO NOT try to wade over to dry ground
- Less than six-inches of fast-flowing water can sweep people off their feet
- Climb to the roof of the vehicle and call to witnesses to immediately dial 911
- The odds of making it across safely regardless of the type of vehicle being driven are low



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**Road
Closed**

- Heavy military trucks driven by the National Guard have been swept downstream in what appeared to be just a foot or two of water





**Road
Closed**

- **Never try to outrun a flash flood down a canyon, arroyo, or cement-lined flood control channel by foot or in a vehicle**
- **If a sudden loud sound upstream is heard, exit the vehicle, leave a campsite, and seek higher ground immediately**
- **There may be no warning by authorities, and only seconds to evacuate to higher ground**



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Photo credit: http://outhouserag.typepad.com/hurricane_watch/katrina_pictures/

FLOOD PREPARATION

- Know the flood risk and elevation above flood stage—know if local streams or rivers flood easily
- Be prepared to move to a place of safety
- Know evacuation routes
- Keep fuel in the gas tank—if electric power is cut off, gas stations may not be able to operate pumps for several days
- Store drinking water in clean bathtubs and in various containers; water service may be interrupted
- Keep a stock of food that requires little cooking and no refrigeration
- Keep first aid supplies on hand
- Keep a battery-powered portable radio, emergency cooking equipment, and flashlights in working order



LOW-WATER CROSSINGS

- Visit the National Oceanic and Atmospheric Administration (NOAA) at <http://www.noaa.gov/floods.html>
- This site also has an interactive map displaying current river conditions around the United States and its territories

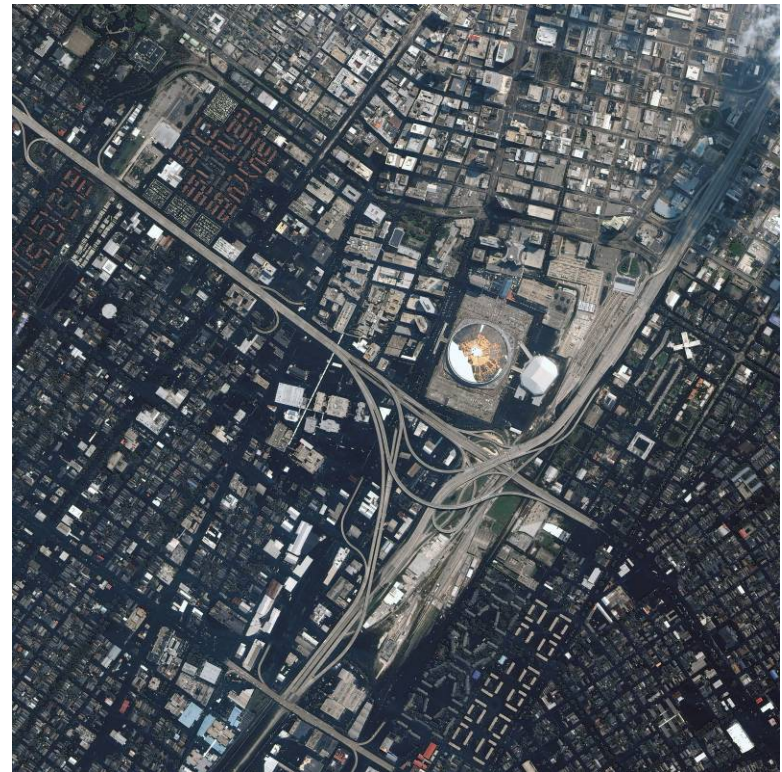


Photo courtesy of <http://www.digitalglobe.com/>



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REDUCED RISK DRIVING HABITS IN FLOODED AREAS

- In an area where flooding may occur, move the vehicle to higher ground if flooding is expected
- Avoid damage to the vehicle by moving it from a flooded area as soon as possible
- Do not drive unless absolutely necessary
- Do not attempt to drive through water if unsure of the depth



REDUCED RISK DRIVING HABITS IN FLOODED AREAS

- Don't drive through fast-moving water, such as at a flooded bridge approach—the car could be swept away
- Drive slowly and steadily to avoid creating a bow wave, and allow on-coming traffic to pass first
- Keep the engine revving
- Be considerate-- driving through water at speeds above a slow crawl can result in water being thrown onto pavements, soaking pedestrians or cyclists



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REDUCED RISK DRIVING HABITS IN FLOODED AREAS

- If the car stalls, immediately abandon it and climb to higher ground
- Watch footing, just six inches of fast-moving floodwater can sweep a person off his/her feet
- Test the brakes as soon as possible after driving through water
- If the vehicle has been in the flooded area for any prolonged period contact a mechanic for further advice
- If the vehicle has only been in a flood for a short period, drive with extreme caution and take the car to be checked at the earliest opportunity



WINTER DRIVING



- Driving in the winter means snow, sleet and ice that can lead to slower traffic, hazardous road conditions, hot tempers and unforeseen dangers
- Manage risk by making sure the vehicle and driver are prepared
- The leading cause of death during winter storms is transportation accidents



Photo courtesy of the AAA Foundation



WEATHER

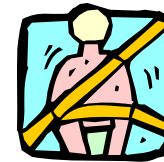


- At any temperature, whether at 20° F below zero or 90° F above, weather affects road and driving conditions and can present serious problems
- It is important to monitor forecasts on the Web, radio, TV, cable weather channel, or in the daily papers
- Ideally, wait until the snowplows and/or sanding trucks have prepared the roads before driving



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WINTER STORM WATCH AND WARNING



- A winter storm watch indicates that severe winter weather may affect your area
- A winter storm warning indicates that severe winter weather conditions are definitely on the way
- A blizzard warning means that large amounts of falling or blowing snow and sustained winds of at least 35 mph are expected for several hours
- Web source for information on winter driving:
<http://www.mdt.mt.gov/travinfo/>



CAR PREPARATION—KNOW YOUR CAR



- Every car has different handling characteristics—know what the car can and cannot do in poor traction driving conditions
- Know if the vehicle is equipped with antilock brakes (ABS) Electronic Stability Control (ESC) and traction control, how they work, and how they help
- Practice using these features in an empty parking lot before using them on the roads



CAR PREPARATION—KNOW YOUR CAR



Maintenance

- A poorly maintained vehicle can lead to serious consequences—the first step to preparation is checking the following items

Tuneup

- If the vehicle is due for regular service, get it done before winter sets in—bad parts can leave drivers stranded
- Oil level (if necessary, replace existing oil with a winter grade oil or the SAE 10w/30 weight variety)

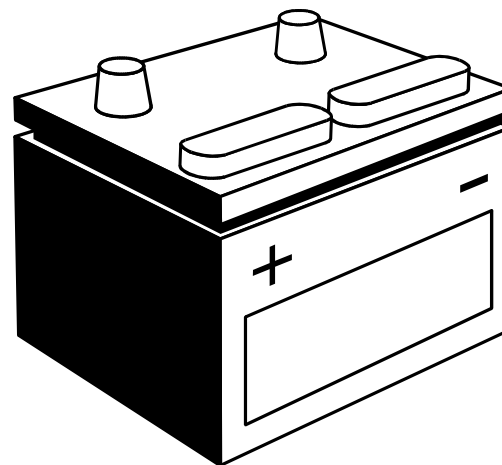
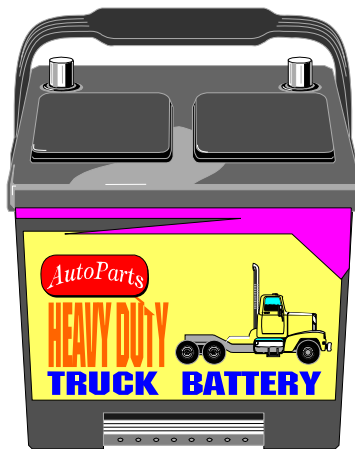


BATTERY



Two things to remember about batteries

- **First**—the battery that started a car easily in the summer may not have enough oomph to do it in winter, when the oil isn't as "fluid" as it was last July
- **Second**—batteries lose power as the temperature drops—cars need **MORE** power to start in winter, but get **LESS** power from the same battery



CAR PREPARATION—KNOW YOUR CAR



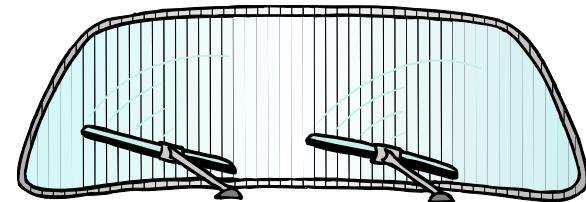
Antifreeze: Cars can overheat in winter if coolant is low or empty

- For most areas, a 50-50 mix of coolant to water is needed



Wipers and windshield washer fluid:

Make sure your windshield wipers are in good shape and the washer fluid reservoir is filled with antifreeze fluid and top it off frequently



CAR PREPARATION—KNOW YOUR CAR



Front window defroster works

Also the rear defroster if available

Gas tank kept close to full

If the car gets stuck or stranded, the engine is the only source of heat



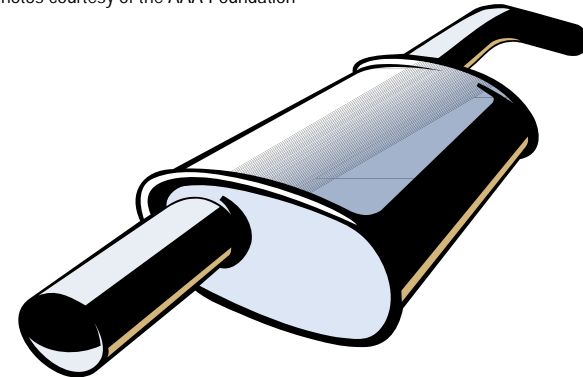
CAR PREPARATION—KNOW YOUR CAR



- If stuck with the engine running, be sure to keep a window open a crack to prevent carbon monoxide asphyxiation
- Keep the exhaust pipe clear of snow



Photos courtesy of the AAA Foundation

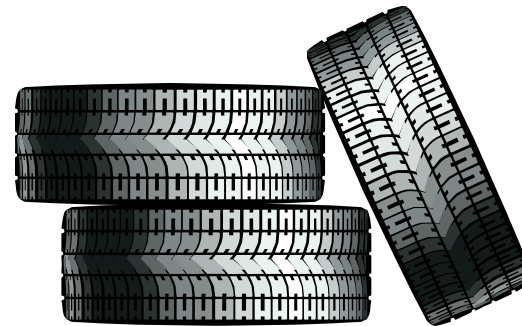


CAR PREPARATION—KNOW YOUR CAR



Install good winter tires: Make sure the tires have adequate tread—all-weather radials are usually adequate for most winter conditions

- Some jurisdictions require vehicles to be equipped with chains or snow tires with studs to drive on their roads especially over mountain passes during snowstorms



✓ WINTER CAR CARE KIT



- ✓ **Booster cables**
- ✓ **Bottled water**
- ✓ **Brightly colored cloth to use as a flag to alert others if stranded**
- ✓ **Canned or dried fruit and nuts**
- ✓ **Cards, games, and puzzles**
- ✓ **Cell phone for emergency calls**
- ✓ **Extra set of mittens, socks, and a wool cap**
- ✓ **Flashlights with extra batteries**
- ✓ **First aid kit with pocket knife**
- ✓ **Keep a windshield scraper and small broom for ice and snow removal**
- ✓ **Matches**
- ✓ **Newspapers for insulation**
- ✓ **Necessary medications**
- ✓ **Plastic bags (for sanitation)**
- ✓ **Rain gear and extra clothes**
- ✓ **Set of tire chains or traction mats**
 - Practice putting tire chains on and off before they are needed
- ✓ **Several blankets and sleeping bags**
- ✓ **Small sack of sand for generating traction under wheels**
- ✓ **Small shovel**
- ✓ **Small tools (pliers, wrench, screwdriver)**

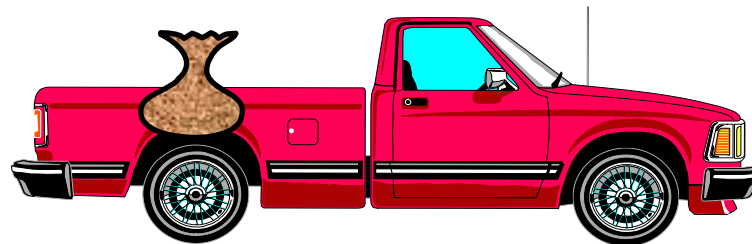


WINTER CAR CARE KIT



Is sand needed?

- Rear-wheel drive vehicles can benefit from a few bags of sand over the rear axle—somewhere in the trunk aligned with the center of the rear wheels
- On front-wheel drive vehicles sandbags are not needed for weight since the engine is already over the front drive wheels
- Know the laws for snow tires; some states require four studded tires



WIND CHILL



- **"Wind chill"** is a calculation of how cold it feels outside when the effects of temperature and wind speed are combined
- A strong wind combined with a temperature of just below freezing can have the same effect as a still air temperature about 35 degrees colder



NWS Windchill Chart



| | | Temperature (°F) | | | | | | | | | | | | | | | | | | |
|------------|----|------------------|----|----|----|----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| | | Calm | 40 | 35 | 30 | 25 | 20 | 15 | 10 | 5 | 0 | -5 | -10 | -15 | -20 | -25 | -30 | -35 | -40 | -45 |
| Wind (mph) | 5 | 36 | 31 | 25 | 19 | 13 | 7 | 1 | -5 | -11 | -16 | -22 | -28 | -34 | -40 | -46 | -52 | -57 | -63 | |
| | 10 | 34 | 27 | 21 | 15 | 9 | 3 | -4 | -10 | -16 | -22 | -28 | -35 | -41 | -47 | -53 | -59 | -66 | -72 | |
| | 15 | 32 | 25 | 19 | 13 | 6 | 0 | -7 | -13 | -19 | -26 | -32 | -39 | -45 | -51 | -58 | -64 | -71 | -77 | |
| | 20 | 30 | 24 | 17 | 11 | 4 | -2 | -9 | -15 | -22 | -29 | -35 | -42 | -48 | -55 | -61 | -68 | -74 | -81 | |
| | 25 | 29 | 23 | 16 | 9 | 3 | -4 | -11 | -17 | -24 | -31 | -37 | -44 | -51 | -58 | -64 | -71 | -78 | -84 | |
| | 30 | 28 | 22 | 15 | 8 | 1 | -5 | -12 | -19 | -26 | -33 | -39 | -46 | -53 | -60 | -67 | -73 | -80 | -87 | |
| | 35 | 28 | 21 | 14 | 7 | 0 | -7 | -14 | -21 | -27 | -34 | -41 | -48 | -55 | -62 | -69 | -76 | -82 | -89 | |
| | 40 | 27 | 20 | 13 | 6 | -1 | -8 | -15 | -22 | -29 | -36 | -43 | -50 | -57 | -64 | -71 | -78 | -84 | -91 | |
| | 45 | 26 | 19 | 12 | 5 | -2 | -9 | -16 | -23 | -30 | -37 | -44 | -51 | -58 | -65 | -72 | -79 | -86 | -93 | |
| | 50 | 26 | 19 | 12 | 4 | -3 | -10 | -17 | -24 | -31 | -38 | -45 | -52 | -60 | -67 | -74 | -81 | -88 | -95 | |
| | 55 | 25 | 18 | 11 | 4 | -3 | -11 | -18 | -25 | -32 | -39 | -46 | -54 | -61 | -68 | -75 | -82 | -89 | -97 | |
| | 60 | 25 | 17 | 10 | 3 | -4 | -11 | -19 | -26 | -33 | -40 | -48 | -55 | -62 | -69 | -76 | -84 | -91 | -98 | |

Frostbite Times

30 minutes

10 minutes

5 minutes

Wind Chill (°F) = 35.74 + 0.6215T - 35.75(V^{0.16}) + 0.4275T(V^{0.16})

Where, T= Air Temperature (°F) V= Wind Speed (mph)

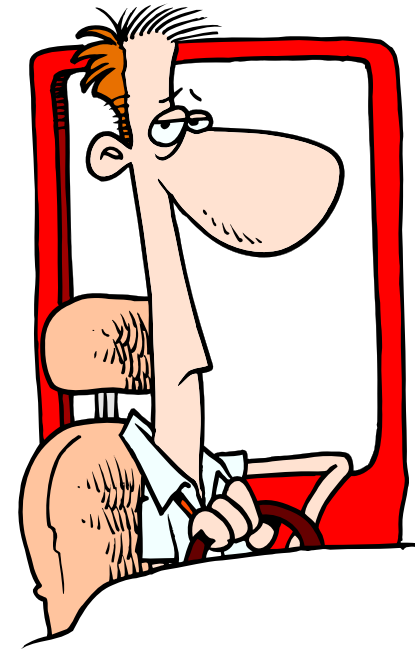
Effective 11/01/01



FROST BITE AND HYPOTHERMIA



- Symptoms of frostbite include a loss of feeling and a white or pale appearance in fingers, toes, or nose and ear lobes
- Symptoms of hypothermia include uncontrollable shivering, slow speech, memory lapses, frequent stumbling, drowsiness, and exhaustion



BLOWING SNOW AND WHITEOUTS



- When traveling in falling snow, remember to be especially careful when the road is first covered with snow
- Stay alert for snow removal vehicles. Snow plow blades can extend into more than one traffic lane.



BLOWING SNOW AND WHITEOUTS



- Wind-driven snow can cause "whiteout" conditions that can reduce visibility to the point that motorists cannot see the road or other vehicles
- When encountering whiteout conditions, reduce speed (a lot if necessary) until conditions improve or find a safe place to pull off of the road and remain there until the storm ends



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BLOWING SNOW AND WHITEOUTS



- While driving at normal speeds and suddenly plowing through a snowdrift, drivers may lose control of their vehicle
- To avoid this, always reduce speed enough to make it through the snow while not losing control
- This is not an easy task to master, even for experienced drivers



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BLIZZARDS— the Worst of Winter Storms



- A blizzard is a storm that contains heavy snowfall, strong winds, and cold temperatures
- Winds are 35 mph or greater - visibility is reduced to less than one-fourth mile
- Creates near zero visibility, deep drifts, and life-threatening wind chill factors
- Never venture out in blizzards or continue to travel if a storm is upgraded to a blizzard
- Seek shelter immediately



Photo courtesy of the AAA Foundation



IF TRAPPED IN A CAR DURING A BLIZZARD



- Stay in the car unless help is visible within 100 yards
- Crack a window for ventilation
- Display a trouble sign
- Occasionally run the engine and heater to keep warm
- Keep the exhaust pipe clear of snow



FREEZING RAIN AND SLEET



- Freezing rain is extremely dangerous to travelers since it can coat roadways with ice and reduce friction needed for traction
- Traveling on ice should be avoided
- Be patient and find a safe place to pull off the highway and wait for maintenance crews to apply additional deicing materials



FREEZING RAIN AND SLEET



Sleet and snow pellets

Sleet and snow pellets often occur during major winter storms when the atmosphere is near freezing on the eastern edge of the storm

- Usually this is a sign of a "large and dangerous" storm that will have strong winds and colder weather following
- Always monitor weather forecasts before traveling and keep the car's radio tuned to the local radio station when traveling



ICY ROADS



- **Decrease speed and leave plenty of room to stop**
- **Allow at least three times more space from the vehicle in front**
- **Brake gently to avoid skidding**
- **If the wheels start to lock up, ease off the brake**
- **Use low gears to keep traction, especially on hills**
- **Don't use cruise control or overdrive on icy roads**
- **Be especially careful on bridges, overpasses and infrequently traveled roads, which will freeze first**
- **Don't assume any vehicle can handle all conditions**

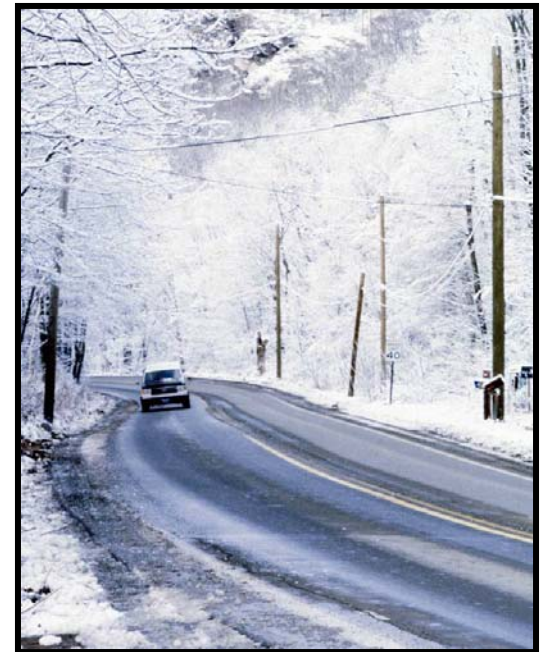


Photo courtesy of the AAA Foundation



HOT WEATHER DRIVING



- As summer time approaches, the nation's roads and highways become crowded and potentially dangerous
- According to the National Highway Traffic Safety Administration (NHTSA), more Americans are killed in traffic crashes during the months of June, July and August
- A few easy precautions can make hot weather driving less stressful and reduce risk



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VEHICLE PREPARATION



- Prepare the vehicle to take the stress of high temperatures in the summer
 - Check tire air pressure
 - Check the air conditioner



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VEHICLE PREPARATION



- If the car overheats, first wait for the engine to cool
- Do not attempt to remove the radiator cap because the pressurized coolant is extremely hot and will spray out with great force
- Do not pour water over the radiator or engine, since a dramatic change in temperature could cause damage
- After the engine cools a bit, add a 50-50 mix of coolant and water to the reservoir to bring it up to its proper level.
- An engine may take many hours to cool, especially on a hot day
- If the coolant level is low, the engine should be completely cooled before adding water, or the engine could easily crack



Reduced Risk Driving Habits in Hot Weather



TEMPERATURE GAUGE



- Check the indicator lights and gauges frequently
- If the temperature gauge moves up, turn off the air conditioner and turn on the vehicle's heater to its highest and hottest setting
- If stopped in traffic put the car in "park" and lightly step on the gas to help circulate coolant
- If the temperature light goes on or if the gauge enters the red zone, immediately pull off the road to a safe spot, well away from traffic



Reduced Risk Driving Habits in Hot Weather



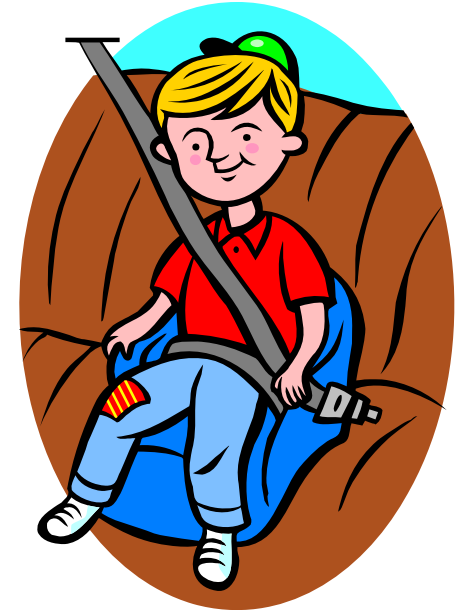
- Never leave a child or pet in a parked car in summer heat—outside temperature in the 80's can quickly bring a car's interior to well over 140°.
- Always lock the doors and trunk—even at home—and keep keys out of children's reach
- Watch children closely around cars, particularly when loading and unloading



Reduced Risk Driving Habits in Hot Weather



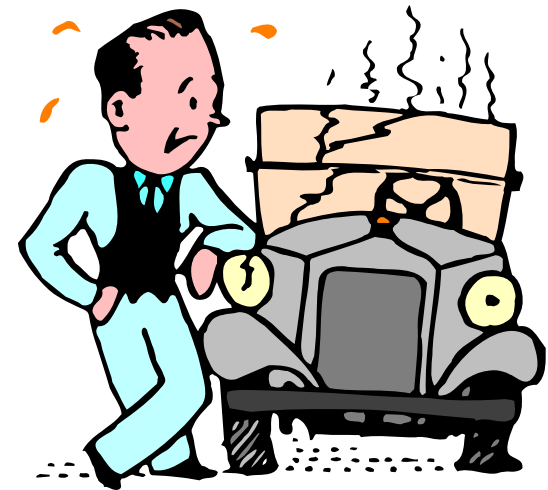
- Check to ensure that all children are accounted for when leaving the vehicle
- Don't overlook sleeping infants
- When restraining children in a car that has been parked in the heat, check to make sure that seating surfaces and equipment (car seat and seat belt buckles) are not overly hot
- Check tire air pressure



Reduced Risk Driving Habits in Hot Weather



- Summertime brings out thousands of joggers and cyclists—be aware of them and share the road
- If traveling a long distance, plan the trip for early in the morning or late in the evening—the weather is a bit cooler and will make it easier on the car's engine
- Take breaks while on a long drive
- Bring a cell phone for emergency calls

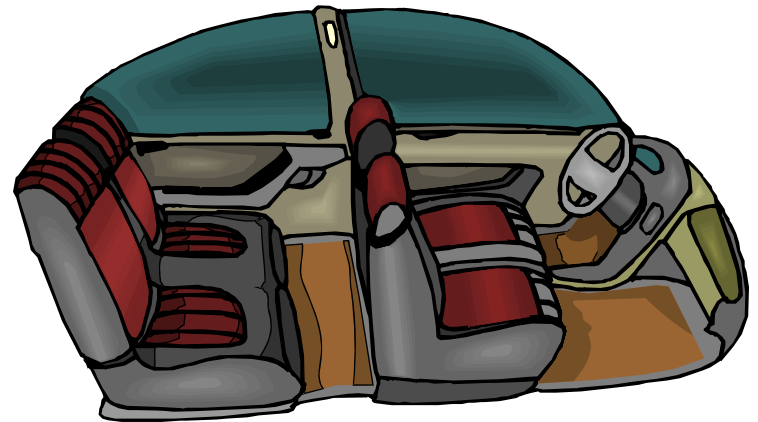


Reduced Risk Driving Habits in Hot Weather



To keep the interior of the vehicle a few degrees cooler consider the following:

- Tint the windows ensuring the tint complies with all regulations
- Use a sun shade
- Keep the windows open for the first few minutes of driving after it has been parked—even with the air conditioner on to allow the hot interior air to escape and allow the vehicle's air conditioner to work better, sooner



Standards and Benchmarks



1. Laws and Highway System

- a. know the laws outlined in the Montana Driver's manual
- b. understand the laws outlined in the Montana Driver's manual
- c. consistently demonstrate knowledge and understanding by responsible adherence to highway transportation system traffic laws and control devices

2. Responsibility

- b. demonstrate the ability to make appropriate decisions while operating a motor vehicle
- c. consistently display respect for other users of the highway transportation system
- d. develop habits and attitudes with regard to responsible driving

3. Visual Skills

- a. know proper visual skills for operating a motor vehicle
- b. communicate and explain proper visual skills for operating a motor vehicle
- c. demonstrate the use of proper visual skills for operating a motor vehicle
- d. develop habits and attitudes with regard to proper visual skills

4. Vehicle Control

- a. demonstrate smooth, safe and efficient operation of a motor vehicle
- b. develop habits and attitudes relative to safe, efficient and smooth vehicle operation.



Standards and Benchmarks



5. Communication

- a. consistently communicate their driving intentions (i.e., use of lights, vehicle and personal signals)
- b. adjust their driver behavior based on observation of highway transportation system and other users
- c. adjust communication (i.e., use of lights, vehicle and personal signals) based on observation of highway transportation system and other users
- d. develop habits and attitudes relative to effective communication

6. Risk Management

- a. understand driver risk-management principles
- b. demonstrate driver risk-management strategies
- c. develop driver risk-management habits and attitudes

7. Lifelong Learning

- a. understand past, present and future vehicle and roadway design, and driving cultures
- c. understand benefits of a lifelong learning approach to driving
- e. identify opportunities for lifelong education in driving

8. Driving Experience

- a. acquire at least the minimum number of BTW hours over at least the minimum number of days, as required by law, with a Montana approved driver education instructor
- b. be encouraged to acquire additional BTW driving experience with their parent or guardian's assistance in a variety of driving situations (i.e., night, adverse weather, gravel road, etc.).

